

Kanban Efficiency Measurement System (KEMS)

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Abstract- It is important for a manufacturing industry to practice Kanban to place a position in the current competitive world. And not only the organization, it is important that the suppliers also should practice Kanban techniques. This study aims to create a system to rate the suppliers on the basis of Kanban efficiency.

Keywords- Kanban; Inventory; Quality

I. INTRODUCTION

Kanban – meaning "signboard" – is a concept related to lean and just in time (JIT) production. According to Taiichi Ohno, Kanban is one of the means through which JIT is achieved [1]. Kanban is not an inventory control system, but it can be considered as a system for visualizing work, making it flow, reducing waste, and maximizing customer value. It is a pull system, because it uses the rate of demand to control the rate of production, passing demand from the end customer up through the chain of customer-store processes.

It is very important for suppliers to maintain a required quantity of minimum stock at the organization. But also it is very important that it should not go beyond the maximum value also. If the number of particular material comes down than the required quantity, then the supplier should supply the required amount of materials to keep the stock balanced. This should go through a kanban system. In the case of dissolving stocks, if the supplier fails to supply the parts, the production line will get stop. So it is mandatory for the suppliers to supply the products under any circumstances. Sometimes the supplier production unit may be 1000 miles away from the company and it may take 1 week or more for the materials to dispatch. But, if the company needs the materials in two days, for that, either they have to set-up a hub near to the company or should use premium transportation facilities. The first one is preferred more than the second one. It is also very important for the suppliers to maintain proper communication of supplier Kanban stocks details daily. So that the company can know about the status of the materials that the supplier supplies. If the material is below the minimum required quantity, they should give the details of the no of materials that are going to dispatch to resolve the issue. Quality is the super-most criteria that look for a material. If

the material failed to meet the quality requirements, the material should be rejected. But this will affect the line stoppages. So it is very important for the suppliers to maintain the quality requirements. In case of any change in the design of the material, Modification Reference Number (MRN) should be produced and get approval from the respective authorities and after Engineering Change Notice (ECN) should be implemented. The old design materials will remain in the stock. So start implementing new products only after the old designs stock gets over or customers are ready to pay for the old stock. So to measure the efficiency of kanban among the suppliers 'Kanban Efficiency Measurement System' (KEMS) is implemented. This helps the buyers to rate the suppliers on the basis kanban and it will help in managing inventories organization as well as in supply chain.

II. LITERATURE SURVEY

Pull system is used to manage inventory and control flow of material. It is driven from downstream needs which trigger upstream production. At the manufacturing area, the pull system would be able to reduce inventory level by replenishing parts that are consumed by the customer. The authorization of production begins when a part is pulled from the inventory area [2, 3]. Kanban means card in Japanese; this card contains all the required information for this system [2]. The Kanban system serve as a tool to regulate pattern of material flow that effectively links upstream operations to downstream operations. Several research were made about the Kanban system. Sendir Kumar and Panneerselvam [4] in their literature review had described that a few methods was found out such as Kanban, Conwip and supply chain management in order to achieve JIT goals. Other than that, the Kanban pull system is widely implemented in repetitive manufacturing environments that focus to minimize work in progress inventory, increase throughput and improve production efficiency. Card attached to part is removed when demand from downstream occurs. Then this card would be returned to trigger production at upstream. Therefore, the Kanban system aid to reduce inventory by producing just in time to meet demand at each production stage [2, 4]. N. Singh and Kwok Hung Shek[2] studied how to develop the Kanban system at an assembly area using General Purpose Simulation System. In order to achieve lean goal, essentially kanban system is

established on factory floor to align flow of material by removing all waste and sources of waste. Waste is anything that customer is not willing to pay for and it could be categorized into 7; transportation, over inventory, excess of motion, waiting, over process, over production and defect [4, 5, 6]. There are two types of the Kanban systems, the single card Kanban system and two card Kanban system [4]. Single card Kanban system uses only 1 type of Kanban card to trigger upstream production when it needed. This card is called the Production Instruction Kanban (PIK). The two card Kanban systems uses two types of card which are Production Withdrawal Kanban (PWK) and Production Instruction Kanban (PIK). PWK card is used to withdraw needed goods from preceding process and PIK card is used to give instruction to preceding process to produce what is needed for replenishment purpose. A Kanban system implemented at a manufacturing area is equipped with relevant tools. These tools are used to smooth the system, visualize current operation and assist production associate to work according to takt time. Heijunka board, lot formation post, kanban post and kanban card are tools used in establishing kanban pull system.

III. METHODOLOGY

The problems that faced by many organizations in the purchase department is the inventory imbalance. This is caused due to irregular supply of materials by the suppliers. The main cause for this irregularity is unscientific methods of supplies by the suppliers.

The study is carried out in Rane Madras Ltd, Mysuru. Rane is one of India's largest steering manufacturing company. It has a total of 180 suppliers. The company is following the kanban system as well as the company insist the suppliers also to follow kanban system. But there are many limitations for the suppliers to adopt this. The major reason is they don't want take a step forward from the conventional supply techniques as they think it is the best and the safest. So to overcome this situation and to make the suppliers to do kanban, a new ranking system based on kanban is introduced which is called Kanban Efficiency Measurement System (KEMS) or it can be also termed as Kanban Scorecard.

The KEMS is created based on the kanban criteria and quality also taken into consideration. The score is rated out of hundred and dropping of each point cost the supplier to pay penalty. The criterions for the kanban scorecard are mentioned below:

1) **Suppliers maintaining stock at organization(30 points)**

It is mandatory for the suppliers to maintain minimum stock at organization. This is done to maintain the smooth working of production line as it requires a minimum number of parts available in the organization. And it is also important that, the stock shouldn't go above the maximum limit. This is because, increase in inventory cause excess storage area, maintenance cost and excess labours which is a burden for the organization. So it is important for the suppliers to maintain a balanced stock at the organization. Whenever a supplier fails to maintain stock at organization or for the excess stock, they will loose points with respect to the abnormal stock status.

2) **Suppliers maintaining stock at Hub(30 points)**

Suppliers should keep minimum stock at vendor hub or transporter hub. Such kind of stock are called Vendor stock. This is important in the concern of a production unit because whenever there is a sudden change in demand and needed more numbers of parts or materials, this will be useful. Unlike the maintaining stock at organization, there is no maximum limit for maintaining stock at vendor hub. They can keep as much as inventories in their hub, as it won't be a burden for the organization.

3) **Communication of supplies to organization regarding kanban(20 points)**

It is as important, as maintaining the stock, that to communicate with the organization to give details about the stock daily. This will help the buyers to know about the stock status at organization as well as in hub, so that they can plan the purchase according to the requirement and moreover the production line won't stop because of the unavailability of the materials.

4) **Quality (20 points)**

As quality doesn't comes under kanban tangentially, but still it is very important as concern to a production unit. In the organization, every supplier should possess ISI certificate or at least TS certificate. So the chance of quality issue is very low. But still it cannot keep aside because rarely some quality issues are happening. If a supplier fails in the quality thrice in a year, severe actions will be taken or the supplier can be terminated from further supplies.

IV. IMPLEMENTATION

'Kanban Efficiency Measurement System' or KEMS is successfully implemented in the organization and now ranking

of suppliers is done with ease. At the start, it is done with few suppliers but now it is done with much more suppliers.

The monitoring is done twice in a month. This made easy for the buyers (in purchase department) to rate the suppliers with the kanban scores and alert them regarding the issue. This also made suppliers to think about kanban system and implement kanban in their organization because of the penalties they face due to the inefficiency of their current system. This will not only help the organization also it will be helpful for the suppliers as they maintain kanban, they can do supply smoothly to their other customers as they maintain definite stock at their hub. Table 3.1 shows KEMS table of suppliers from the month January, 2017 to May, 2017. Table 3.2 shows the list of suppliers on the basis of lost points.

Table 1. Kanban Efficiency Measurement System

KANBAN EFFICIENCY MEASUREMENT SYSTEM								
List of suppliers who failed to achieve 100% efficiency								
Vendor code	Supplier		Points obtained by maintaining stock at RANE	Points obtained by maintaining stock at hub	Communication of supplier about stock details daily	Quality	Total	Month
		PLAN	30	30	20	20	100	
11630	FFF	Actual	20	20	20	20	80	15-01-17
22653	AILL	Actual	20	30	20	20	90	
11109	SAPL	Actual	30	20	20	10	80	30-01-17
11630	FFF	Actual	20	20	20	20	80	
11109	SAPL	Actual	30	20	20	10	80	
10799	SSS	Actual	20	20	20	20	80	14-02-17
40885	JKF	Actual	20	20	20	20	80	
11630	FFF	Actual	20	20	20	20	80	
10799	SSS	Actual	20	20	20	20	80	28-02-17
40885	JKF	Actual	30	20	20	20	90	
11630	FFF	Actual	20	20	20	20	80	
11109	SAPL	Actual	20	20	20	20	80	15-03-17
10073	GEL	Actual	30	20	20	20	90	
11630	FFF	Actual	20	20	20	10	70	
11109	SAPL	Actual	20	20	20	20	80	
10561	MF	Actual	10	20	20	20	70	
10111	BSFL	Actual	20	30	20	10	80	30-03-17
40885	JKF	Actual	20	20	20	20	80	
10797	SFL	Actual	30	30	20	10	90	
10796	SIL	Actual	20	20	20	20	80	30-03-17
11109	SAPL	Actual	30	30	20	10	90	
10004	ABC	Actual	30	30	20	10	90	
12712	UPC	Actual	30	30	20	10	90	
10111	BSFL	Actual	30	30	20	10	90	
10562	MFPL	Actual	30	30	20	10	90	
11630	FFF	Actual	20	20	20	10	70	
10796	SIL	Actual	20	20	20	20	80	15-04-17
10800	SI	Actual	30	30	20	10	90	
22663	AUI	Actual	30	30	20	10	90	
10562	MFPL	Actual	30	30	20	10	90	
10561	LFL	Actual	20	30	20	20	90	
10797	SFL	Actual	30	20	20	20	90	30-04-17
11630	FFF	Actual	20	20	20	10	70	
10796	SIL	Actual	20	20	20	20	80	
33275	KEPL	Actual	20	20	20	20	80	15-05-17
10561	MF	Actual	30	30	10	20	90	
10797	SFL	Actual	30	20	20	20	90	
11630	FFF	Actual	20	20	20	10	70	
10796	SIL	Actual	20	20	20	20	80	
11109	SAPL	Actual	20	20	20	10	70	30-05-17
10005	AE	Actual	20	30	20	20	90	
10111	BSFL	Actual	20	20	20	10	70	
10561	MF	Actual	30	30	10	10	80	
10797	SFL	Actual	30	20	20	20	90	
11630	FFF	Actual	20	30	20	10	80	30-05-17
11109	SAPL	Actual	30	30	20	10	90	
35921	NF	Actual	0	0	10	20	30	
10561	MF	Actual	20	30	10	20	80	

Table 2. Points lost by the suppliers during Kanban Monitoring

Vendor code	Supplier	Points lost by suppliers by failing to maintain Kan ban at RML	Points lost by suppliers by failing to maintain Stock at supplier	Points lost due to improper Communication of supplier Kan ban stock details daily	Points lost due to quality issue	Total
11630	FFF	90	80	0	50	220
11109	SAPL	30	50	0	50	130
10561	MF	30	10	30	10	80
10796	SIL	40	40	0	0	80
35921	NF	30	30	10	0	70
10111	BSFL	20	10	0	30	60
22663	AUI	20	0	0	20	60
40885	JKFL	20	30	0	0	50
10797	SFL	0	30	0	10	40
10562	MFPL	0	0	0	20	20
33275	KEPL	10	10	0	0	20
10800	SI	0	0	0	10	10
12712	UPC	0	0	0	10	10
10005	AE	10	0	0	0	10
10561	LF	10	0	0	0	10
10073	GEL	0	10	0	0	10

V. CONCLUSION

After the implementation of Kanban Efficiency Measurement System, a new approach of kanban is started following by the purchasing department. This helps the buyers (in the purchase department) to control the inventories and the suppliers. They can rank the vendors/suppliers according to the kanban score and they are capable of taking actions against suppliers who perform badly in KEMS. So certainly, KEMS is very much useful for an organization and in future, further modifications can be done in this system according to the nature of the organization.

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